

NOTES ON SYMPHYLA WITH DESCRIPTIONS OF THREE  
NEW SPECIES OF SYMPHYLELLA FROM CALIFORNIA

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Members of the class Symphyla are widely distributed throughout California. During the past year considerable time has been devoted by the author to a search for members of this class. They have been found under a wide variety of conditions, and apparently can be collected in practically any location in the region adjacent to San Francisco Bay. Representatives of the class have been found in pasture land, on hill sides, along stream banks, in forested areas, at Point Reyes on the beach at highest tide level, and in fact in almost every conceivable environment. They may be found in soils varying from sands to clays. They are probably as abundant in nature as most other arthropods.

Although a number of new species have been collected, only three members belonging to the genus *Symphylella* will be described in this paper. The writer believes that considerable caution should be practiced in describing new species because the variation found within a species is so great that it would be quite possible to describe two different stages of the same species as new. In working out the life history of *Scutigereilla immaculata* (Newp.)<sup>1</sup> marked variations were observed even after the animals reached the stage with twelve pairs of legs. It was found that they moult from time to time throughout their entire life, and that this makes possible morphological changes.

No life-history study has been attempted with any other member of the class, but enough information is at hand to indicate that most of the species have a rather complex life history. For example, in studying cleared and stained large specimens of *Symphylella subterranea*, an individual was encountered which at the time it was collected was just about ready to cast its skin. On the slide the old and new integuments are easily seen, one within the other. This specimen was as large as any I have ever collected, indicating that moulting in this species probably occurs from time to time even after sexual maturity is reached. Other specimens have been examined in about the same condition, where a new skin can be seen within the old one.

<sup>1</sup> Michelbacher, A. E. The biology of the garden centipede, *Scutigereilla immaculata*. Hilgardia, 11 (3): 55-148, 1938.

In studying large series of individuals which appear to be mature, variations in size, number of antennal segments, and number of setæ on the various anatomical regions are encountered. These variations are probably the result of the moulting characteristics of the group. Because of these differences, I have found it very difficult to describe a species and believe it inadvisable to do so unless an investigator has a large series with which to work. Several symphylans have previously been described from one or two specimens, but such a practice can often lead to confusion. In some cases much stress has been placed on chaetotaxy. The present study certainly shows that in the same species the chaetotaxy of two individuals may show considerable variation.

The following descriptions are made from prepared mounts and all measurements given have been obtained from mounted specimens.

*Symphylella subterranea* Michelbacher, n. sp.

Figures 1a to 1g

*Head* somewhat elongate, about 1.3 times longer than wide; central rod (coronal suture) interrupted at the middle, without median lateral branches; anterior branches (frontal sutures) prominent but less distinct than the central rod; post-antennal organs of average size. *Antennæ* with 18 to 23 segments (holotype 21 segments); setæ on basal segments very prominent and rather long, but much reduced on the distal segments; setæ on inner side of the basal segments nearly twice as long as those on outer side; beginning of a second whorl of setæ at about the 7th or 8th segment; with several small circular sensory organs along greatest circumference of ante-apical segment, this segment usually containing the largest number of these organs, although they may be present on the next 11 or more segments toward the proximal end. On the right antenna of the holotype there are three of these organs on the second segment and one each on the next 13 segments while on the left antenna there appear to be two such organs on the second segment and one each on the next 12 segments. Only the 13 *scuta* having the triangular processes are considered and these are referred to by numbers; processes all triangular in shape, their tips produced into small knobs. Knobs in the holotype generally round, their greatest diameter usually slightly more than the width of their attachment. Anterior-lateral setæ of second scutum much shorter than the processes. First pair of *legs* reduced to wart-like structures, remaining pairs well developed, and sparsely covered with setæ.

Tarsus of last pair of legs about 4.3 times as long as wide, its upper surface with six rather prominent setæ which are as long as, or a little longer than, width of tarsus. Tibia of last pair of legs with four rather prominent setæ on upper surface, their length equal to about half the depth of the segment. *Styli* very much reduced, cone-shaped, densely covered with short hairs, and about twice as long as their width at base. Seven pairs of fully developed *coxal sacs* located at bases of fully developed legs from second to eighth pairs inclusive. *Cerci* large and well covered with setæ, those setæ on the inner surface curved and of nearly equal length, while those on the outer surface are of two types—short, more numerous curved setæ, and larger protruding setæ. Striped organ only about the length of the apical setæ or not quite as long as the longest lateral setæ. Length of cerci about 3.5 times their greatest width. *Length* of holotype 5.1 mm.

Holotype, No. 4798, Calif. Acad. Sci., Ent., Clarksburg, California.

Occasionally specimens are encountered in which the knobs are elongate on some of the scuta. In such cases their greatest width is nearly the same as their attachment. The number of setæ between the anterior lateral and the apical setæ of the scuta shows considerable variation even in mature specimens. The variation in the type and the range in variation is shown in table 1. The number of marginal setæ on the two sides of the same scutum of the same individual may show some variation.

This species has only been collected in a single field where it was encountered in fair abundance. It inhabits the lower layers of soil and can seldom be taken above a depth of six inches. It is not attracted to growing vegetation and probably feeds on fungus. It is rather slow in motion.

Probably the most prominent feature of this species is its large size, which distinguishes it from most other members of the genus. It is most closely related to *S. essigi* n. sp. and the differences are considered under the description of the latter species.

### *Symphylella essigi* Michelbacher, n. sp.

Figures 2a to 2h

*Head* somewhat elongate, about 1.2 times as long as wide; central rod (coronal suture) interrupted at about middle, without median lateral branches; anterior branches (frontal sutures) prominent, but slightly less distinct than the central rod. Post-antennal organs of average size. *Antennæ* of 18 to 21 segments

(holotype 21 segments); setæ very prominent and rather long on basal segments but much reduced on distal segments; setæ on inner side of basal segments about one and one-half times as long as those on outer side; a second whorl of setæ beginning at about the sixth segment. Beginning with the second from the apical segment, and in the type on the next six segments, small circular sense organs are found which are in line with the whorl of primary setæ. The number of sense organs found on the different segments starting with the third from the apical segment on the right antenna is 2, 2, 1, 1, 1, 1, 1; for the left antenna 2, 2, 1, 1, 2, 2, 2. This is a variable character and even in mature specimens these sense organs may be present on only five segments. The most constant feature is that they apparently always start with the second segment from the apex. Only the 13 *scuta* having the triangular processes are considered and these are referred to by numbers. In all cases the triangular processes are prominent and their tips rounded. There is a comparatively slight indication of the tips being produced into knobs. The number of setæ between the anterior lateral and the apical setæ shows considerable variation even in mature specimens. The variation in the type and the range in variation expected to occur in the species is shown in table 1. The number of marginal setæ on the two sides of the same scutum of the same individual may show some variation. The anterior-lateral setæ of the second scutum are shorter than the processes. First pair of *legs* reduced to wart-like structures, the remaining pairs well developed and sparsely covered with setæ. Tarsus on the last pair of legs about four and one-half times as long as wide, its upper surface with eight rather prominent setæ about as long as the depth of the segment. This character shows some slight variation as individuals with seven or nine setæ are encountered. Tibia of the last pair of legs with four rather prominent setæ on the upper surface (in the holotype there are six), their length equal to at least one-half the depth of the segment. *Claws* very unequal, the anterior one being twice the size of the posterior. *Styli* much reduced, cone-shaped, densely covered with very short hairs, about twice as long as their width at the base. Seven pairs of fully developed *coxal sacs* are located at bases of fully developed legs from second to eighth pairs inclusive. *Cerci* large, well covered with recurved setæ which are all about the same length, although there may be one or two protruding setæ which are slightly longer than the rest. Striped organ only about as long as the apical setæ. Length of the cerci at least three times their greatest width. The holotype, which is not normally extended, measures 3.8 mm. Large, normally extended individuals should measure 4 mm. to 4.8 mm.

Holotype, No. 4799, Calif. Acad. Sci., Ent., collected on a stream bank in a silty loam near Moraga, Contra Costa County,

California. Other specimens have been collected in several localities in Marin and Napa counties. It is possible that some of the individuals collected in these latter localities may prove to be new although no character has yet been found to separate them. This species is adapted to a wide range of soils and has also been taken in the sand hills at Point Reyes.

This species is rather closely related to *Symphylella subterranea* but is easily separated from it by several good characters. The tips of the triangular processes of the scuta are rounded whereas in *S. subterranea* they are produced into knobs. Also, fewer setæ are found along the lateral margins of the scuta in *S. essigi*. There are fewer setæ on the upper surface of the tarsus of the last pair of legs in *S. subterranea* than in *S. essigi*. The peculiar circular sensory organs are present on the second from the apical segment in *S. essigi* whereas in *S. subterranea* they are found on the first from the apical segment and occur on a larger number of segments toward the proximal end. In *S. subterranea* the setæ on the outer side of the cerci are long and short whereas in *S. essigi* they are nearly of the same length.

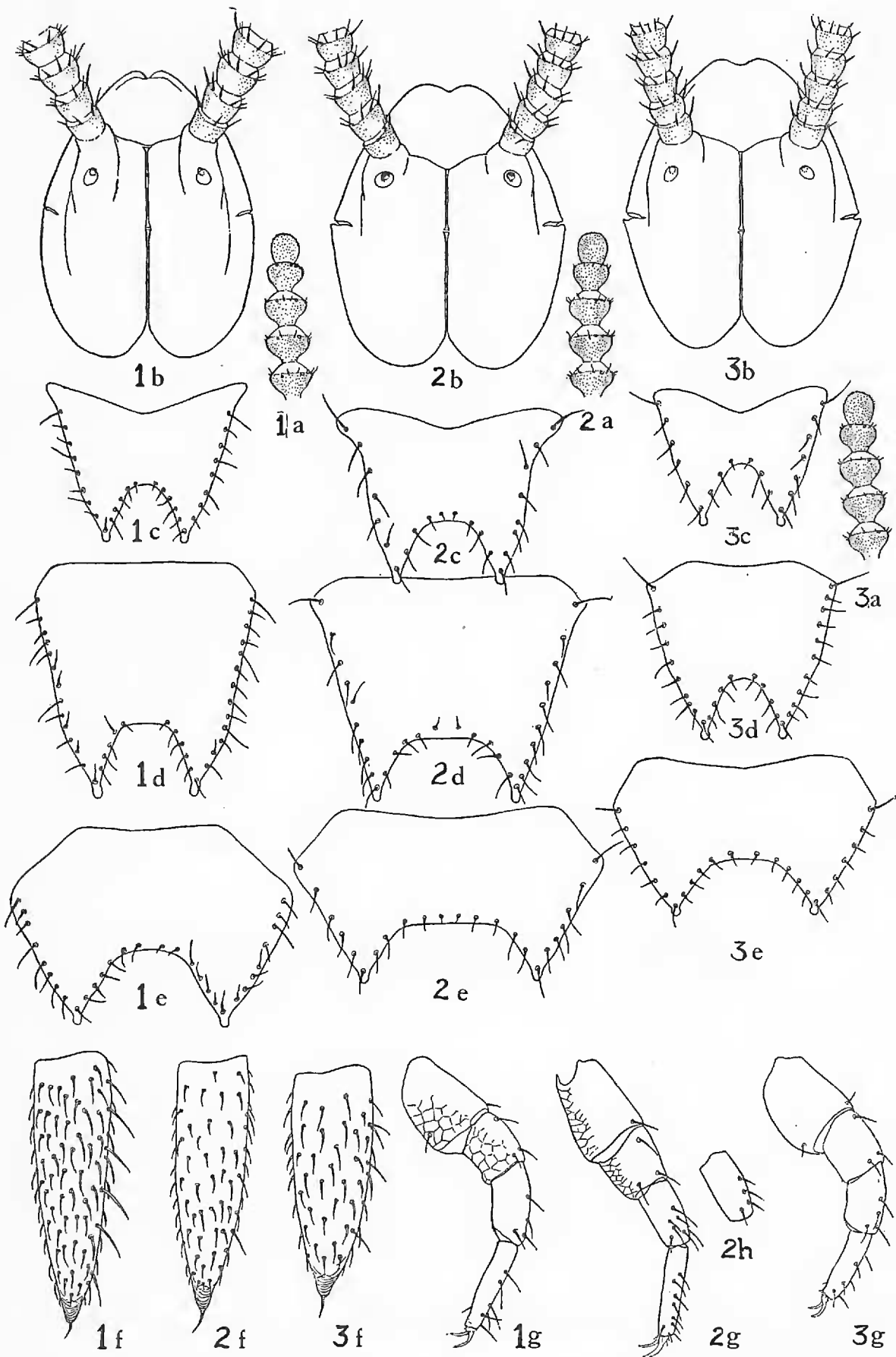
TABLE I

Number of Setæ Found between the Anterior Lateral Setæ and the Apical Setæ on the Scuta which have Triangular Processes.

| Scutum number | <i>Symphylella subterranea</i> sp. n. |                               | <i>Symphylella essigi</i> sp. n. |                               | <i>Symphylella capitata</i> sp. n. |                               |
|---------------|---------------------------------------|-------------------------------|----------------------------------|-------------------------------|------------------------------------|-------------------------------|
|               | Number of setæ*                       | Range in the number of setæ** | Number of setæ*                  | Range in the number of setæ** | Number of setæ*                    | Range in the number of setæ** |
| 1             | 7 - 7                                 | 6 - 7                         | 5 - 6                            | 4 - 6                         | 5 - 4                              | 4 - 7                         |
| 2             | 12 - 11                               | 9 - 12                        | 8 - 8                            | 7 - 8                         | 8 - 9                              | 6 - 9                         |
| 3             | 7 - 7                                 | 5 - 7                         | 4 - 5                            | 4 - 6                         | 5 - 5                              | 4 - 5                         |
| 4             | 8 - 7                                 | 6 - 8                         | 6 - 5                            | 4 - 6                         | 6 - 6                              | 5 - 7                         |
| 5             | 13 - 13                               | 9 - 13                        | 9 - 9                            | 8 - 9                         | 9 - 9                              | 6 - 9                         |
| 6             | 9 - 8                                 | 6 - 9                         | 5 - 5                            | 5 - 6                         | 5 - 5                              | 4 - 6                         |
| 7             | 9 - 10                                | 7 - 10                        | 6 - 5                            | 4 - 6                         | 6 - 5                              | 5 - 7                         |
| 8             | 10 - 12                               | 9 - 12                        | 8 - 7                            | 7 - 9                         | 8 - 9                              | 7 - 9                         |
| 9             | 7 - 6                                 | 5 - 7                         | 5 - 4                            | 4 - 6                         | 4 - 4                              | 4 - 5                         |
| 10            | 9 - 7                                 | 6 - 9                         | 6 - 5                            | 4 - 6                         | ? - 6                              | 4 - 6                         |
| 11            | 10 - 11                               | 9 - 11                        | 7 - 7                            | 7 - 8                         | 7 - 7                              | 6 - 9                         |
| 12            | 5 - 6                                 | 5 - 7                         | 3 - 4                            | 3 - 5                         | 4 - 3                              | 3 - 5                         |
| 13            | 9 - 9                                 | 6 - 9                         | 6 - 6                            | 4 - 6                         | 5 - 4                              | 4 - 7                         |

\*The number of submarginal and marginal setæ, between the anterior lateral setæ and the apical setæ, and the variation observed on the two sides of the same scutum in the type specimen.

\*\*Range in the number of submarginal and marginal setæ between the anterior lateral setæ and the apical setæ.



EXPLANATION OF PLATE

Fig. 1. *Symphylella subterranea* n. sp. 1a tip of antenna, x 80; 1b head, x 80; 1c to 1e first three large scuta, x 95; 1f spinneret, x 110; 1g hind leg, x 100.

Fig. 2. *Symphylella essigi* n. sp. 2a tip of antenna, x 80; 2b head, x 80; 2c to 2e first three large scuta, x 95; 2f spinneret, x 105; 2g hind leg, x 95; 2h tibia of hind leg showing usual number of setæ, x 95.

Fig. 3. *Symphylella capitata* n. sp. 3a tip of antenna, x 130; 3b head, x 130; 3c to 3e, first three large scuta, x 140; 3f spinneret, x 140; 3g hind leg, x 135. Only marginal and submarginal setæ have been drawn on the scuta.

### *Symphylella capitata* Michelbacher, n. sp.

#### Figures 3a to 3g

*Head* somewhat elongate, about 1.2 times as long as wide; central rod (coronal suture) interrupted at about middle without lateral branches; anterior branches (frontal sutures) prominent but not as distinct as central rod; post-antennal organs of average size. *Antennæ* of 17-22 segments (holotype 18 segments); setæ very prominent and rather long on basal segments but much reduced on distal segments; setæ on inner side of basal segments slightly longer than those on outer side. Beginning with the first from the apical segment and on the next ten segments in the holotype, small circular sense organs are found which are in line with the whorl of setæ. On the first from the apical segment there are three organs and on the other segments one each. The number of segments carrying these sense organs shows some variation within the species, but in mature specimens they should be found on at least 11 segments. In some cases the apical segment may carry a single sensory organ. This was found rather commonly in specimens collected at Lagunitas, California. The arrangement in one large specimen from that locality, which has 22 segments in the right antenna, is as follows, starting with the apical segment: 1, 4, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1. The number found on the two antennæ of the same individual may show some variation. Only the 13 *scuta* having the triangular processes are considered and these are referred to by numbers. In all cases the triangular processes are prominent and their tips are produced into rounded knobs whose diameters are about one and one-half times the width of their attachment. The number of setæ between the anterior-lateral and the apical setæ shows considerable variation even in mature specimens. The variation in the holotype and the range in variation expected to occur in the species is shown in table 1. Anterior-lateral setæ of second scutum about two-thirds as long as processes. First pair of *legs* reduced to wart-like structures, the remaining pairs well developed and sparsely covered with setæ. Tarsus of the last pair of legs about three and one-half times as long as wide, its upper surface with six prominent setæ which are as long as the greatest depth of the

segment. Tibia of the last pair of legs with four prominent setæ on the upper surface which are at least as long as one-half the width of the segment. *Styli* very much reduced, cone-shaped, densely covered with very short hairs, about one and one-half times as long as their width at the base. Seven pairs of fully developed *coxal sacs* located at the bases of fully developed legs from second to eighth pairs inclusive. *Cerci* large, well covered with setæ; setæ on inner surface recurved and all of about the same length, while those found on the outer surface are of two types—recurved setæ similar to those found on the inner surface, and much longer straight setæ. Striped organ about the length of the apical setæ. Length of cerci about three times their greatest width. *Length* of holotype, 3 mm.

Holotype, No. 4800, Calif. Acad. Sci., Ent., Tunnel Road Canyon, Oakland, California, January 22, 1938. Specimens were found abundant on canyon slope in first two inches of soil. This species is rather widespread, having been taken on El Cerrito Hill, El Cerrito, California, and in several localities in Marin and Napa counties. Collections were made during the months of January to April inclusive, and individuals were found most abundant in the first two inches of soil. Moist sedimentary soils having a grass cover appeared to be localities best suited to the species.

This species appears to be rather closely related to *Symphylella pusilla* (Han.) but can easily be distinguished from that species by its larger size and fewer antennal segments. Also in *S. pusilla* there are fewer setæ on the second scutum between the anterior lateral and apical setæ. The large rounded knobs found on the tips of the triangular processes also tend to separate *S. capitata* from other members of the genus.

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#### PERSONAL NOTE

Owing to the rapid growth of the Department of Entomology of the California Academy of Sciences it has become increasingly difficult for me to keep up with that work and at the same time to do justice to the editing of the Pan-Pacific Entomologist. I have, therefore, asked the Publication Committee to find some one else to act as editor. They have now selected R. L. Usinger as such editor, and correspondence regarding editorial matters connected with this journal should be addressed to him, here at the California Academy of Sciences.—E. P. Van Duzee.